

## **ABSTRACT**

A spherical actinometer integrates the omnidirectional radiant flux over time to obtain the radiant energy or fluence incident on the sphere utilizing a small spherical vessel containing a solution that responds to germicidal radiation but not ambient room light. In one embodiment the actinometric solution, is an aqueous mixture of iodide and iodate that is optically opaque at 254 nm but insensitive to radiation above 330 nm. The UV-induced formation of triiodide, is facilitated by the presence of iodate that acts as an electron acceptor. The formation of triiodide, which is easily measured spectroscopically with a photometer, occurs with a quantum yield of 0.75 for 254 nm radiation at 21° C. The actinometric measurement of UV fluence using the system is substantially independent of the size of the measuring device.

## **Listing of the Claims**

Claim 1. (Previously presented) Apparatus for measuring the UV fluence in a space comprising a spherical containment vessel of any given size appropriate for the space in which UV fluence is to be measured having a UV transmissively passive spherical wall containing an actinometric fluid of iodine and iodate at a pH of about 9.25 that is optically opaque at a known wave length said spherical vessel serving as an omni-directional irradiation vessel and as an omnidirectional colorimetry measurement vessel.

Claim 2. Cancelled..

Claim 3. (Previously presented) An apparatus as defined in claim 1 wherein said actinometric fluid is an aqueous mixture of iodine and iodate that is optically opaque at 254 nm but insensitive to radiation above 330 nm.

Claim 4. (As originally presented) An apparatus as defined in claim 1 wherein said spherical containment vessel is made from quartz.

Claim 5. (As originally presented) An apparatus as defined in claim 1 wherein said spherical containment vessel has a volume of less than about 1 cubic centimeter.

Claim 6. (Previously presented) An as defined in claim 1, wherein said actinometric fluid comprises a aqueous solution having a molar concentration of iodide and iodate of about 3: % .

Claim 7. (Previously presented) An apparatus as defined in claim 1 comprising a colorimeter operatively configured to measure absorbance of light passing through said spherical containment vessel and actinometric fluid therein for determination of UV fluence independently of the containment vessel dimension.

Claim 8. (Previously presented) Apparatus as defined in claim 7 further comprising a plurality said spherical containment vessels containing said actinometric fluid dispersed within a volume of said space for irradiation and subsequent measurement of absorbance therein with said colorimeter to determine fluence in said volume.

Claim 9. (Previously presented) Apparatus as defined in claim 8 wherein said spherical containment vessel and said actinometric fluid therein have a net neutral buoyancy relative to water for dispersion of said plurality of spherical of containment vessels in a volume of water for

irradiation within said volume of water and subsequent measuring of fluence throughout the volume.

Claim 10. (Previously presented) A method of determining UV fluence in a space comprising the steps of preparing a plurality of spherical actinometers of indeterminate dimension containing and actinometric solution therein of iodine and iodate at a pH of about 9.25 that is optically opaque at a wave length of 254 nm; dispersing said actinometers throughout said volume for a known time; measuring the change in transmissiveness of the actinometer after said period of time; and calculating the fluence using the relation: fluence (mJper cm<sup>2</sup>) =  $\Delta$  Abs (470 nm) x K x 0.6 ml/cm<sup>2</sup> where K is a constant for the wavelength.